

REMARKS

Claims 1-14, 16-22 and 26-29 are pending in this application. By this Amendment, claims 1 and 26 are amended. The amendments introduce no new matter. Reconsideration of the application based on the above amendments and the following remarks is respectfully requested.

The courtesies extended to Applicant's representative by Examiner Gimie at the September 28, 2006 personal interview are appreciated. The reasons presented at the interview as warranting favorable action are incorporated into the remarks below and constitute Applicant's record of the interview.

Applicants appreciate the indication of allowability regarding claims 7-10, 18 and 19. Those claims are indicated as allowable if rewritten in independent form including all the features of the base claim and any intervening claims. The base claim and intervening claims are allowable for the reasons discussed below.

During the September 28 personal interview, the Examiner proposed amending claims 1 and 26 to recite that the first air-fuel mixture is produced in a manifold to distinguish the pending claims over the applied prior art references. The amendments to claims 1 and 26 are taken in light of this proposal by the Examiner.

Entry of the amendments is proper under 37 CFR §1.116 since the amendments: (a) place the application in condition for allowance for the reasons discussed herein; (b) do not raise any new issue requiring further search and/or consideration as the amendments amplify issues previously discussed throughout prosecution, including during the personal interview with the Examiner; and (c) place the application in better form for appeal, should an appeal be necessary. The amendments are necessary and were not earlier presented because (1) they are made in response to arguments raised in the final rejection; and (2) are responsive to the

Examiner's proposal presented during the personal interview. Entry of the amendments is thus respectfully requested.

The Office Action, in paragraph 2, rejects claims 1-6, 11-17, 20 and 26-29 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 4,414,940 to Loyd in view of U.S. Patent No. 5,365,902 to Hsu. Additionally, the Office Action, in paragraph 3, rejects claims 21 and 22 under 35 U.S.C. §103(a) as being unpatentable over Loyd in view of U.S. Patent No. 6,651,432 to Gray. Applicant understands that, because claims 21 and 22 depend from claim 1, the rejection of these claims relies on Hsu, in combination with these references, as well. These rejections are respectfully traversed.

No permissible combination of the applied prior art references teaches, or can reasonably be considered to have suggested, the combinations of all the features recited in independent claims 1 and 26 respectively. For example, none of the applied prior art references teach, or can reasonably be considered to have suggested, a first fuel-air mixture production module that produces a first fuel-air mixture in a manifold containing a first fuel and the air at a specific ratio, which avoids auto ignition of the first fuel-air mixture through the compression by said air-fuel mixture compression mechanism, in said combustion chamber with the features recited in claim 1. Claim 26 recites similarly allowable features.

Additionally, Loyd fails to teach, or otherwise render obvious, other of the features attributed to it by the Office Action. For example, Loyd does not teach an ignition module that ignites the second fuel-air mixture to compress and auto ignite the first fuel-air mixture after producing said first fuel-air mixture, as is positively recited in independent claim 1, and similarly recited in claim 26. Rather, Loyd teaches an ignition module that ignites a "second" fuel-air mixture before production of a "first" fuel-air mixture, as those terms are recited in the pending claims. Specifically, the fuel from a pilot injection nozzle 36, which the Office Action considers as corresponding to a second fuel-air production module, is ignited by spark

plug 40 as it discharges, and the heat from the burning fuel raises the temperature and pressure and chemically conditions the gas in the combustion chamber so that the fuel from a main fuel injection nozzle, which the Office Action considers as corresponding to a first fuel-air production module, is auto ignited as it is discharged into the combustion chamber (Abstract and col. 5, lines 39-60 of Loyd). Therefore, the fuel from the pilot nozzle, as taught by Loyd, is ignited prior to the introduction of the main fuel into the gas combustion chamber. Therefore, Loyd cannot reasonably be considered to teach, or otherwise render obvious, an ignition module that ignites the second fuel-air mixture to compress and auto ignite the first fuel-air mixture after producing said first fuel-air mixture, as recited in claims 1 and 26.

Neither Hsu nor Gray are applied in a manner to overcome this shortfall in the application of Loyd to the subject matter of the pending claims.

Further, the combination of at least Loyd and Hsu is unreasonable. As recognized in the Office Action, Loyd fails to teach an internal combustion engine using a second fuel that is different from a first fuel, as recited in independent claims 1 and 26. The Office Action asserts that the deficiencies of Loyd are remedied because Hsu discloses the use of two different fuels. The Office Action further asserts that a person of ordinary skill would have been motivated to modify Loyd with the teachings of Hsu in order to improve combustion of the main fuel.

One of ordinary skill would not have been motivated to modify Loyd to use the two different fuels of Hsu, and, even if they were, the resulting combination would not have the features recited in independent claims 1 and 26. Loyd specifically states that "[i]n a given engine, the same fuel is used by both pilot injection nozzle 36 and by main injection nozzle 38." Col. 5, lines 12-14 of Loyd. Thus, Loyd itself teaches away from such a modification.

Despite this, the Office Action assumes that a person of ordinary skill need only modify the Loyd system to use two different fuels and, after that modification, simply inject

the two different fuels disclosed in Hsu. This analysis fails to address at least how the fuels disclosed in Hsu interact. Hsu discloses the use of two fuels that are injected according to two specific methods that depend on the load conditions of the engine. Specifically, for a high-load condition, the Hsu main fuel is injected at a specific angle and, before the complete injection of the main fuel, a pilot fuel is then injected from the center of the combustion chamber and ignites immediately (see Hsu at col. 4, lines 43-47, and col. 5, lines 33-55). For a low-load condition, the Hsu pilot fuel is injected first and ignites immediately, and the main fuel is then introduced and immediately burned (see Hsu at col. 6, lines 18-23). According to Hsu, the order of injection is reversed under these different conditions because in a low-load condition an appropriate fuel-air mixture cannot be formed and the main fuel must burn as soon as it enters the cylinder (see Hsu at col. 6, lines 11-15). Accordingly, in order for a person of ordinary skill to modify the Loyd system to use the two fuels disclosed in Hsu, significant modifications would be required to the Loyd system, including varying the timing and mode of ignition, as well as injection cycles of the pilot and main fuel injectors, based on varying load conditions. Such modifications would change Loyd's principle of operation, which specifically includes igniting the pilot fuel by spark ignition as it enters the combustion chamber before introduction of the main fuel, therefore rendering the asserted combination improper.

Also, there is no identified motivation in the prior art to modify the Loyd system with the teachings of Hsu. It is not obvious that the Hsu fuels will work in the Loyd system, or that the Loyd system could in any way be modified to accommodate such fuels. Also, even if modified to handle two different fuels, there is no indication that the invention of Loyd would properly burn the fuels as directed in Hsu. Finally, there is no identified evidence that the Loyd system would function in accordance with the positively recited features of claims 1 or 26 if modified to accommodate the Hsu fuels. The Office Action fails to provide support for

its assertion that the modification of Loyd with Hsu would be prompted by a purported improved combustion of the main fuel.

The conclusory statement of the Office Action is not enough to prove that there is a teaching, suggestion or motivation in the prior art to combine these references in the manner suggested by the Office Action. The Federal Circuit recently reaffirmed its prior holdings asserting that "rejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *In re Kahn*, Appeal No. 04-1616, March 22, 2006 (Fed. Cir.) (quoting *In re Lee*, 277 F.3d 1338, 1343-46 (Fed. Cir. 2002), and *In re Rouffet*, 149 F.3d 1350, 1355-59 (Fed. Cir. 1998)).

MPEP §2143.01 instructs that "[t]he mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination." MPEP §2143.01 further instructs that "[a]lthough a prior art device 'may be capable of being modified to run the way the apparatus is claimed, there must be a suggestion or motivation in the reference to do so.'" *See also In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990). Applicant respectfully submits that the rejection of at least independent claims 1 and 26 is improper in view of at least MPEP §2143.01 because the Office Action lacks the required specific evidence of a teaching, suggestion or motivation in the prior art for one of ordinary skill to combine the references.

For at least these reasons, the references are not combinable in the manner suggested, and any permissible combination of the applied prior art references cannot reasonably be considered to teach, or have suggested, the combinations of all the features recited in independent claims 1 or 26. Additionally, claims 2-6, 11-14, 16, 17, 20-22 and 27-29 are also neither taught, nor would they have been suggested, by any permissible combination of the applied prior art references for at least the respective dependence of the claims directly or


indirectly on independent claims 1 and 26, as well as for the separately patentable subject matter that each of these claims recite.

Accordingly, reconsideration and withdrawal of the rejections of claims 1-6, 11-14, 16, 17, 20-22 and 26-29 are respectfully requested.

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 1-6, 11-14, 16, 17, 20-22 and 26-29 , in addition to the indication of allowability regarding claims 7-10, 18 and 19, are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,



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